vitesse) $\Rightarrow \left(m\omega - \frac{k}{\omega}\right)^2$ est min $\Rightarrow m\omega - \frac{k}{\omega} = 0$

d'où $\omega = \omega_0 = \sqrt{\frac{k}{m}} = 12,9 rad.s^{-1}$

c) * $V_m = \frac{F_m}{h} \Rightarrow X_m = \frac{F_m}{\omega V_m} = 5,37cm \Rightarrow T_m = kX_m = 1,34N.$

Donc T_m diminue de 1,5N à 1,34N.

* $\varphi_F - \varphi_V = 0 \Rightarrow \varphi_F - \varphi_x = \frac{\pi}{2}$

$$\Rightarrow \varphi_F - \varphi_T = \varphi_F - \varphi_x + \pi = -\frac{\pi}{2}.$$

T(t) devient en quadrature avance / F(t).

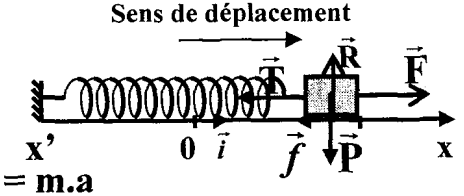
* $\omega = \omega_0 = 12,9 rad.s^{-1} \Rightarrow T = T_0 = 0,487s.$

La période diminue de 0,628s à 0,487s.

Exercice N°4 :

1°)Système solide

$\vec{P} + \vec{R} + \vec{T} + \vec{F} = m.\vec{a}$



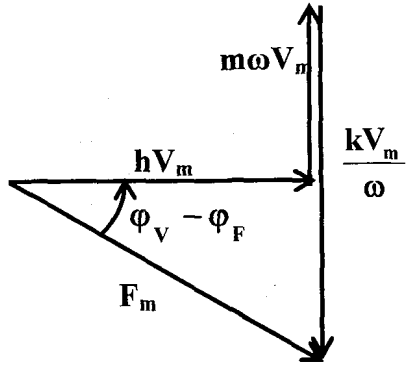
Projection : $- kx + F - hv = m.a$

$$\Rightarrow ma + hv + kx = F \Rightarrow m\frac{dv}{dt} + hv + k\int v dt = F$$

$$\begin{cases} F = F_m \sin(\omega t + \varphi_F) \\ V = V_m \sin(\omega t + \varphi_v) \end{cases}$$

2°) $\omega = 20 rad.s^{-1} < \omega_0 = \sqrt{\frac{k}{m}} = \sqrt{\frac{100}{0,25}} = 25 rad.s^{-1}$

$$\omega^2 < \frac{k}{m} \Rightarrow m.\omega^2 < k \Rightarrow m\omega < \frac{k}{\omega}$$



$$F_m^2 = h^2V_m^2 + \left(\frac{kV_m}{\omega} - mV_m.\omega\right)^2 = V_m^2\left(h^2 + \left(\frac{k}{\omega} - m.\omega\right)^2\right)$$

$$V_m = \frac{F_m}{\sqrt{h^2 + \left(\frac{k}{m} - m\omega\right)^2}}$$

$$V_m = \frac{0,6}{\sqrt{(2,4)^2 + (5-3,2)^2}} = 0,2 ms^{-1}$$

$$tg(\varphi_v - \varphi_F) = \frac{\frac{k}{\omega} - m\omega}{h} = \frac{5-3,2}{2,4} = 0,75$$

$$\varphi_v - \varphi_F = 0,64 rad$$